# (19) World Intellectual Property Organization International Bureau



# 

#### (43) International Publication Date 6 February 2003 (06.02.2003)

## PCT

# (10) International Publication Number WO 03/009944 A1

AZ, BA, BB, BG, BR, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, ES, FI, GB, GD, GE, GH,

GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW,

(51) International Patent Classification7: 3/40 // F24F 3/16

B03C 3/32,

(74) Agents: SUNDSTRÖM, Per et al.; Stenhagen Patentbyrå AB. P.O. Box 4630, S-116 91, Stockholm (SF).

· ·

(21) International Application Number: PCT/SE02/01375

(22) International Filing Date:

11 July 2002 (11.07.2002)

(25) Filing Language:

Swedish

(26) Publication Language:

English

(30) Priority Data: 0102539-4

16 July 2001 (16.07.2001) SE

(71) Applicants and

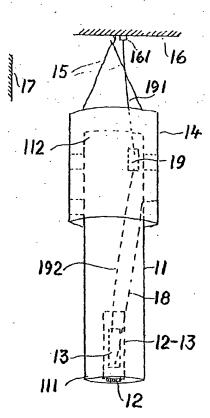
(72) Inventors: SVADIL, Ragne [SE/SE]; Trädgårdsgatan 22, S-172 38 Sundbyberg (SE). WIHK, Ove [SE/SE]; Virebergsvägen 26, S-171 40 Solna (SE). AB, P.O. Box 4630, S-116 91 Stockholm (SE).

(81) Designated States (national): AE, AG, AL, AM, AT, AU,

- MX, MZ, NO, NZ, OM, PH, PL, PT, RO, RU, SD, SB, SG, SI, SK, SL, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VN, YU, ZA, ZM, ZW.
  (84) Designated States (regional): ARIPO patent (GH, GM, KB, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),
- (84) Designated States (regional): ARIPO patent (GH, GM, KE, LS, MW, MZ, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE, SK, TR), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: AN AIR CLEANER



(57) Abstract: An air cleaner comprising an electron generator (12-13) that includes a pointed head (12), a collector element (14) and an electric circuit (13) included in the electronic generator (12-13) for generating a negative potential on the pointed head (12) and a positive potential on the collector element (14). The pointed head (12) is mounted at the free end (111) of a cylinder (11) comprised of electrically non-conductive (insulating) material. The cylinder (11) includes the electric circuit (13) at one end whereas its remaining end (112) enters the collector element (14), which is cylindrical and comprised of electrically conductive material.



Declaration under Rule 4.17:

- of inventorship (Rule 4.17(iv)) for US only

Published:

with international search report

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

#### AN AIR CLEANER

### TECHNICAL FIELD

The present invention relates to an electronic air cleaner of the kind that includes an electron generator that has a pointed head, a collector element, and an electric circuit included in the electronic generator for generating a negative potential on the pointed head and a positive potential on the collector element.

#### 10 DESCRIPTION OF THE BACKGROUND ART

An air cleaner of the aforesaid kind is apparent, for instance, from Swedish Patent Specification 512 282. In the case of the air cleaner illustrated in this prior publication, the pointed head is disposed so as to point out towards the centre of the space in which air shall be cleaned. Moreover, the collector element is comprised of a plate which is positioned so that the pointed head will be directed away from the plate, which has a surface area of at least 150 cm<sup>2</sup> and a convex shape as seen from the pointed head.

Although this air cleaner has been found to fulfil high demands on the cleaning of air in a space in practice, customers have found it somewhat difficult to position the cleaner in rooms of different kinds and configurations as a result of its design. One object of the present invention is to eliminate this drawback.

#### SUMMARY OF THE INVENTION

25

15

20

According to the present invention, the pointed head of an air cleaner of the aforedescribed kind is mounted on the free end of a cylinder comprised of electrically non-conducting material, wherein said cylinder includes the electric circuit and the collector element is included in its remaining end, said element being cylindrical in shape and comprised of electrically conductive material.

#### BRIEF DESCRIPTION OF THE DRAWING

5

15

20

25

30

The invention will now be described in more detail with reference to the accompanying drawing, which illustrates examples of embodiments according to the invention, wherein

- Fig. 1 illustrates an embodiment for suspension from a ceiling;
  - Fig. 2 illustrates an embodiment for placement on a table or floor; and
  - Fig. 3 is a view from above of an alternative embodiment of a collector included in an inventive air cleaner.

### 10 DESCRIPTION OF A PREFERRED EMBODIMENT

The air cleaner illustrated in Fig. 1 includes an electron generator 12-13 that has a pointed head 12, a collector element 14, and an electric circuit 14 included in the electron generator 12-13 for generating a negative potential on the pointed head 12, via a short conductor, and a positive potential on the collector element 14, via a conductor 18.

The pointed head 12, which is comprised of corona points (carbon fibre bristles), (alternatively special steel needles), is mounted on the free end 111 of a cylinder 11 comprised of an insulating material, e.g. ABS plastic. The cylinder 11 includes said electric circuit 13 at one end thereof whereas the other end 112 extends fully or partially through the collector element 14, which is cylindrical and open both at its top and bottom and comprised of electrically conductive material, e.g. aluminium. In the illustrated embodiment, the collector element 14 has an all-round and double-sided collector function (inwards and outwards). The cylinder 11 is held centred in the collector element 14 by means of spacers on the inner wall of said collector element. (By cylindrical is not necessarily meant a circular-cylinder, but a shape that occurs when a straight generatrix is displaced parallel along a closed path).

The air cleaner can be hung by a suspension device 15 from a ceiling 16 for example, alternatively with a line fastened in the cylinder 112. The shortest distance to the ceiling 16 and to a wall 17 should be at least 20 cm. The distance between the collector element 14 and the pointed head 12 will preferably be at least 12 cm and at most 300 cm.

The air cleaner may be powered from the mains (220 volts) via a ceiling-mounted electric fitting 161 and conductor 191 leading to an adapter (transformer) 19, (alternatively fastened to the ceiling or to a fixed mains connection in the wall), which converts the mains voltage to a low-voltage DC voltage (12 volts). This is delivered via a conductor 192 to the electron generator 12-13, which produces an extremely high DC voltage of very low current, about 5 pA.

The air cleaner illustrated in Fig. 2 is principly of the same construction as that shown in Fig. 1, comprising cylinder 11, pointed head 12 and collector element 14. However, the components are placed in reverse in this case, so that the pointed head 12 faces upwards. Furthermore, the air cleaner includes a foot 21-22, which can be placed freely on a floor (or a table). The foot 21-22 consists of an outwardly extended plastic part 21 of the cylinder 11 and an iron foot plate 22 (alternatively a foot plate comprised of acrylic resin) fastened to the lower end of the part 21.

15

25

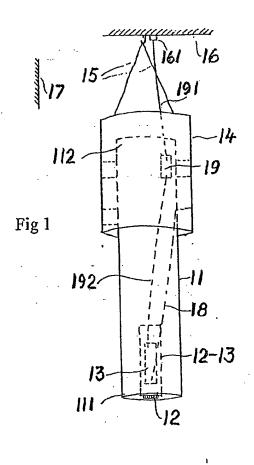
10

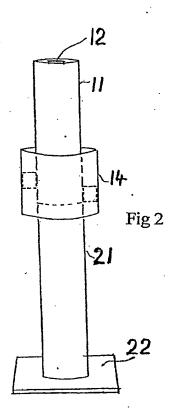
The alternative embodiment of the collector 14 shown from above in Fig. 3 includes a number of mutually identical bulges 341, 342, ... 34n around the cylinder 11. These bulges have softly or gently rounded transitions so as to avoid the point effect.

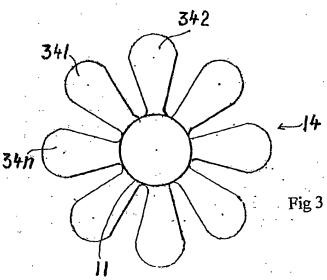
- The described inventive air cleaner differs from other, conventional air cleaners by virtue of the following properties, among other things:
  - as an electronic air cleaner/ioniser; does not create static fields;
  - functions in the absence of movable parts (e.g. fans/blowers);
  - also collects ultrafine particles (smaller than 0.1 m $\mu$ )/?/ in the absence of expensive filters; and is
  - · energy-lean, silent and draught-free.

**CLAIM** 

1. An air cleaner comprising an electron generator (12-13) that includes a pointed head (12), a collector element (14) and an electric circuit (13) included in the electronic generator (12-13) for generating a negative potential on the pointed head (12) and a positive potential 5 on the collector element (14), characterised in that the pointed head (12) is mounted at the free end (111) of a cylinder (11) comprised of electrically non-conductive (insulating) material; and in that the cylinder (11) includes the electric circuit (13) at one end whereas its remaining end (112) passes into the collector element (14), which is cylindrical and comprised of 10 electrically conductive material.







### INTERNATIONAL SEARCH REPORT

international application No.

A CLASSIFICATION OF SUBJECT MATTER  IPC7: B03C 3/32, B03C 3/40 // F24F 3/16 According to International Patient Classification (IPC) or to both assigned classification and IPC  B FIELDS SEA ACHED  Minimum documentation searched (classification system followed by classification symbols)  IPC7: B03C  Documentation searched other than minimum documentation to the extent that such documents are included in the fisids searched  SE, DK, F1, NO classes as above  Electronic data base consulted during the International search (name of data base and, where practicable, search terms used)  C DOCUMENTS CONSIDERED TO BE RELEVANT  Category*  Catalon of document, with indication, where appropriate, of the relevant passages  Relevant to claim No.  EP 0281414 A1 (NEC AITOMATION LITHTED), 7 Sept 1988  (07-09.88), column 3, line 23 – line 34; column 5, line 3 – line 5, figures 5-7,13, claim 7   By a separate state of the extension of the service of the separate state of the extension of the service of the separate state of the extension of the service of the service of the separate state of the extension of the service of particular relevance the channel is three above of the same patent family annex.  ** Special entegories of cited documents are listed in the continuation of Box C.    See patent family annex.   Inc.   Inc		PC1/SE 02/013/5					
Further documents are listed in the continuation of Box C.   Special satisfaction or potent with the system of comment with may throw documents are listed in the continuation of Box C.   Special satisfaction or potent with the system of comment with may throw documents are listed in the continuation of Box C.   Special satisfaction or potent with the system of comment with may throw documents are listed in the continuation of Box C.   Special satisfaction or potent with the system of comment with the system or the system of comments with may throw documents are listed in the continuation of Box C.   Special satisfaction or potent with the system or the system of t	A. CLASSIFICATION OF SUBJECT MATTER						
B. FIELDS SEARCHED  Minimum documentation searched (charaffeation system followed by classification symbols)  IPC7: B03C  Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched SE,DK,FI,NO classes as above  Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  C. DOCUMENTS CONSIDERED TO BE RELEVANT  Category*  Citation of document, with indication, where appropriate, of the relevant passages  Relevant to claim No.  A  EP 0281414 A1 (NEC AUTOMATION LIMTED), 7 Sept 1988 (07.09.88), column 3, line 23 - line 34; column 5, line 3 - line 5, figures 5-7,13, claim 7  A  US 4496375 A (LE VANTINE), 29 January 1985  1  US 4496375 A, (LE VANTINE), 29 January 1985  1  See patent family annex.  **Comment should be the international family and the published on or after the international family and the published on the state of particular relevance and the published on or after the international family and the published on the state of the sta	IPC7: B03C 3/32, B03C 3/40 // F24F 3/16 According to International Patent Classification (IPC) or to both no	stional classification and IPC					
Decumentation searched other than minimum documentation to the extent that such documents are included in the fields searched  SE, DK, FI, NO classes as above  Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  C DOCUMENTS CONSIDERED TO BE RELEVANT  Category*  Citation of document, with indication, where appropriate, of the relevant passages  Relevant to claim No.  A							
Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched  SE,DK,FI,NO classes as above  Electronic data base consulted during the international search (name of data base and, where practicable, search serms used)  C. DOCUMENTS CONSIDERED TO BE RELEVANT  Category* Clastion of document, with indication, where appropriate, of the relevant passages  Relevant to claim No.  A EP 0281414 A1 (NEC AUTOMATION LIMTED), 7 Sept 1988  (07.09.88), column 3, line 23 - line 34; column 5, line 3 - line 5, figures 5-7,13, claim 7  A US 4496375 A (LE VANTINE), 29 January 1985  (29.01.85), figure 5, abstract  1  1  1  1  1  2  3  4  3  4  4  4  4  4  4  4  4  4  4	Minimum documentation searched (classification system followed b	y classification symbols)					
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  C. DOCUMENTS CONSIDERED TO BE RELEVANT  Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No.  A	IPC7: B03C						
Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  C. DOCUMENTS CONSIDERED TO BE RELEVANT  Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No.  A EP 0281414 A1 (NEC AUTOMATION LIMTED), 7 Sept 1988 (07.09.88), column 3, line 23 - line 34; column 5, line 3 - line 5, figures 5-7,13, claim 7  A US 4496375 A (LE VANTINE), 29 January 1985  A US 4496375 A (LE VANTINE), 29 January 1985  I (29.01.85), figure 5, abstract  Special estegories of cited documents  "" document detailing the generic state of the art which is not considered to lead to exclude the published on or after the international siling date."  To be of periodic or patent but published on or after the international siling date or patent with the many flower during the state of the comment in thick allows to comment with the many flower during the comment of patent and the control of the comment in the comment of patent and the control of the comment of patent and the control of the comment with the patent patent for the comment in the comment in the patent patent for the comment of the comment in the patent patent for the comment of the comment in the comment of the comment of the comment in the patent patent for the comment of the comment in the patent patent formation of the comment of	Documentation searched other than minimum documentation to the	extent that such documents are included in the fields searched					
C. DOCUMENTS CONSIDERED TO BE RELEVANT  Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No.  A							
Category* Citation of document, with indication, where appropriate, of the relevant passages Relevant to claim No.  A EP 0281414 A1 (NEC AUTOMATION LIMTED), 7 Sept 1988 (07.09.88), column 3, line 23 - line 34; column 5, line 3 - line 5, figures 5-7,13, claim 7  ——  A US 4496375 A (LE VANTINE), 29 January 1985  (29.01.85), figure 5, abstract  Special energoice of cited documents  "Comment chaining the general state of the art which is not considered to be of particular relevance to earlier application on patent but published on or after the international filing date to earlier application on the continuation of the comment of particular relevance to earlier application on the continuation of the comment of particular relevance to elamed invariable and to examine the paticular of the comment of particular relevance to elamed invariable and the paticular relevance to elamed invariable and comment in skin alone of comment of particular relevance to elamed invariable and the paticular relevance to elamed invariable and the paticular relevance to elamed invariable and the comment of particular relevance to elamed invariable and the paticular relevance to elamed invariable and the comment of particular relevance to elamed invariable and the paticular relevance to elamed invariable and the comment of particular relevance to elamed invariable and the paticular relevance to elamed invariable and the comment of paticular relevance to elamed invariable and the paticular relevance to elamed invariable and the comment of paticular relevance to elamed invariable and the paticular relevance to elamed invariable and the comment of paticular relevance to elamed invariable and the paticular re	Electronic data base consulted during the International search (name	of data base and, where practicable, search terms used)					
Further documents are listed in the continuation of Box C.  See patent family annex.  Special entegories of cited documents  Cap. 01.85), figure 5, abstract  Special entegories of cited documents  Cap. 01.85), figure 5, abstract  Special entegories of cited documents  Cap. 01.85), figure 5, abstract  Special entegories of cited documents  Cap. 01.85), figure 5, abstract  Special entegories of cited documents  Cap. 01.85), figure 5, abstract  Special entegories of cited documents  Cap. 01.85), figure 5, abstract  Cap. 01.85), figure 5, abstract  Special entegories of cited documents  Cap. 01.85), figure 5, abstract  The continuation of the cap. 02.85, abstract of the	C. DOCUMENTS CONSIDERED TO BE RELEVANT						
(07.09.88), column 3, line 23 - line 34; column 5, line 3 - line 5, figures 5-7,13, claim 7   Bus 4496375 A (LE VANTINE), 29 January 1985  (29.01.85), figure 5, abstract  Special eategories of cited documents  document defaining the general state of the art which is not considered to be of particular relevance to be of particular relevance to the state of the state o	Category* Citation of document, with indication, where app	propriate, of the relevant passages Relevant to claim No.					
Further documents are listed in the continuation of Box C.  See patent family annex.  * Special energoises of cited documents **A' document defining the general state of the art which is not considered to be of particular relevance **B' earlier application or patent but published on or after the international filing date **C' document which may throw doubts on priority daim(s) or which is did to establish the publication date of another citation or other special restor (as specialed)  **C' document which may throw doubts on priority daim(s) or which is did to establish the publication date of another citation or other special restor (as specialed)  **C' document treferring to an oral disclosure, use, orbibition or other means **T' document published prior to the international Sling date but later than the priority date claimed.  Date of the actual completion of the international search  Date of the actual completion of the international search  Date of mailing of the international search report  0 5 - 11 - 2002  Authorized officer  ULF NYSTRÖM/BS	(07.09.88), column 3, line 2	3 - line 34; column 5,					
* Special eategories of cited documents  *A' document defining the general state of the art which is not considered to be of particular relevance  *B' earlier application or patent but published on or after the international filing date  *C' document which may throw doubts on priority claim(s) or which is special reason (as specified)  *O' document which may throw doubts on priority claim(s) or which is specified to establish the publication date of another claimon or other special reason (as specified)  *O' document referring to an oral disclosure, use, exhibition or other means  *P' document published prior to the international filing date but later than the priority date claimed  *B' actual completion of the international search  Date of the actual completion of the international search  1 November 2002  Name and mailing address of the ISA/  Swedish Patent Office  Box 5055, S-102 42 STOCKHOLM  *It alter document published after the international tiling date or priority date and not in conflict with the spelication but cited to understand the principle or theory underlying the invention cannot be considered to involve an inventive set when the document is them alone document of particular relevance: the claimed invention cannot be considered to involve an inventive set when the document is considered to involve an inventive set when the document is considered to involve an inventive set when the document is considered to involve an inventive set when the document is considered to involve an inventive set when the document is considered to involve an inventive set when the document is considered to involve an inventive set when the document is considered to involve an inventive set when the document is accounted to involve an inventive set when the document is considered to involve an inventive set when the document is accounted to involve an inventive set when the document is accounted to involve an inventive set when the document is accounted to involve an inventive set when the document is accounted to invo							
* Special eategories of cited documents  *A' document defining the general state of the art which is not considered to be of particular relevance  *B' earlier application or patent but published on or after the international filing date  *C' document which may throw doubts on priority claim(s) or which is special reason (as specified)  *O' document which may throw doubts on priority claim(s) or which is specified to establish the publication date of another claimon or other special reason (as specified)  *O' document referring to an oral disclosure, use, exhibition or other means  *P' document published prior to the international filing date but later than the priority date claimed  *B' actual completion of the international search  Date of the actual completion of the international search  1 November 2002  Name and mailing address of the ISA/  Swedish Patent Office  Box 5055, S-102 42 STOCKHOLM  *It alter document published after the international tiling date or priority date and not in conflict with the spelication but cited to understand the principle or theory underlying the invention cannot be considered to involve an inventive set when the document is them alone document of particular relevance: the claimed invention cannot be considered to involve an inventive set when the document is considered to involve an inventive set when the document is considered to involve an inventive set when the document is considered to involve an inventive set when the document is considered to involve an inventive set when the document is considered to involve an inventive set when the document is considered to involve an inventive set when the document is considered to involve an inventive set when the document is accounted to involve an inventive set when the document is considered to involve an inventive set when the document is accounted to involve an inventive set when the document is accounted to involve an inventive set when the document is accounted to involve an inventive set when the document is accounted to invo							
* Special eategories of cited documents  *A' document defining the general state of the art which is not considered to be of particular relevance  *B' earlier application or patent but published on or after the international filing date  *C' document which may throw doubts on priority claim(s) or which is special reason (as specified)  *O' document which may throw doubts on priority claim(s) or which is specified to establish the publication date of another claimon or other special reason (as specified)  *O' document referring to an oral disclosure, use, exhibition or other means  *P' document published prior to the international filing date but later than the priority date claimed  *B' actual completion of the international search  Date of the actual completion of the international search  1 November 2002  Name and mailing address of the ISA/  Swedish Patent Office  Box 5055, S-102 42 STOCKHOLM  *It alter document published after the international tiling date or priority date and not in conflict with the spelication but cited to understand the principle or theory underlying the invention cannot be considered to involve an inventive set when the document is them alone document of particular relevance: the claimed invention cannot be considered to involve an inventive set when the document is considered to involve an inventive set when the document is considered to involve an inventive set when the document is considered to involve an inventive set when the document is considered to involve an inventive set when the document is considered to involve an inventive set when the document is considered to involve an inventive set when the document is considered to involve an inventive set when the document is accounted to involve an inventive set when the document is considered to involve an inventive set when the document is accounted to involve an inventive set when the document is accounted to involve an inventive set when the document is accounted to involve an inventive set when the document is accounted to invo							
A document defining the general state of the art which is not considered to be of particular relevance  E earlier application or patient but published on or after the international filing date  L document which may throw doubts on priority dainfs) or which is cited to establish the publication date of another citation or other special reason (as specified)  O document referring to an oral disclosure, use, exhibition or other means  Mocument published prior to the international filing date but later than the priority date claimed  Date of the actual completion of the international search  November 2002  Name and mailing address of the ISA/  Swedish Patent Office  Box 5055, S-102 42 STOCKHOLM   date and not in tenulic with the application but cited to understand the principle or theory underlying the invention cannot be document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone  To document published prior to the international filing date but later than the principle or theory underlying the invention cannot be considered novel or cannot be considered novel or cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone  To document published prior to the international filing date but later than the principle or theory underlying the invention to the formatory or cannot be considered novel or cannot be considered novel or cannot be considered to involve an inventive step when the document is a person shilled in the art document or particular relevance the claimed invention cannot be considered novel or cannot be considered novel or cannot be considered novel or cannot be considered to involve an invention or considered novel or cannot be considered	Further documents are listed in the continuation of Box C. X See patent family annex.						
clied to establish the publication date of another citation or other special reason (as specified)  "O" document referring to an oral disclosure, use, exhibition or other means  "P" document published prior to the international filing date but later than the priority date claimed  Date of the actual completion of the international search  I November 2002  Name and mailing address of the ISA/  Swedish Patent Office  Box 5055, S-102 42 STOCKHOLM  "O" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is considered to involve an inventive step when the damed of invention and inventive step when the document is considered to involve an inventive step when the document is considered to involve an inventive step when the document is considered to inventive step when the document is considered to inventive ste	"A" document defining the general state of the art which is not considered to be of particular relevance "B" earlier application or patent but published on or after the international filing date	date and not in condict with the application but cited to understand the principle or theory underlying the invention  "X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive					
The document published prior to the international filing date but later than the priority date claimed  Date of the actual completion of the international search  1 November 2002  Name and mailing address of the ISA/ Swedish Patent Office  Box 5055, S-102 42 STOCKHOLM  Define the same patent family  Date of mailing of the international search report  0 5 - 1 - 2002  Authorized officer  ULF NYSTRÖM/BS	clied to establish the publication date of another citation or other special reason (as specified)  Of document referring to an oral disclosure, use, exhibition or other	"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination					
Date of the actual completion of the international search  1 November 2002  Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM  Date of mailing of the international search report  0 5 - 1 - 2002  Authorized officer  ULF NYSTRÖM/BS	"P" document published prior to the international filing date but later than	being obvious to a person skilled in the art					
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM  ULF NYSTRÖM/BS	Date of the actual completion of the international search	Date of mailing of the international search report					
Swedish Patent Office Box 5055, S-102 42 STOCKHOLM ULF NYSTRÖM/BS		Authorized officer					
	Swedish Patent Office						
	Facsimile No. + 46 8 666 02 86  Form PCT/ISA/210 (second sheet) (July 1998)	Telephone No. + 46 8 782 25 00					

# INTERNATIONAL SEARCH REPORT Information on patent family members

International application No.

30/09/02 PCT/SF 02/01375

EP	0281414	A1	07/09/88	US . JP	4790861 A 1031939 A	13/12/88 02/02/89
	•			JР	1821915 C	10/02/94
				JР	5033290 B	19/05/93
				US	4828165 A	09/05/89
US	4496375	A	29/01/85	NONE	•	

Form PCT/ISA/210 (patent family annex) (July 1998)